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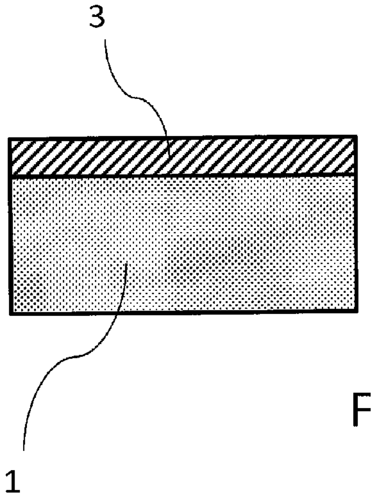

Fig. 1-A

(57) Abstract: A cooking device for microwave cooking, comprises an inorganic binder and 10% to 45% by weight of copper slag;the porosity of said material is in the range of 1% to 15% of water absorption, when measured according to UNI EN ISO 10545-3:2000.

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"DEVICE FOR MICROWAVE COOKING"

FIELD OF THE INVENTION

The present invention relates to a device for cooking food in a microwave apparatus, i.e. in an apparatus suitable to subject a food to microwave radiations.

BACKGROUND ART

The use of microwaves to cook food is well known in the art; also known are the problems deriving from this type of cooking, i.e. the lack of crisping effect in view of the heat being generated within the food. In order to solve this problem, so-called "susceptors" or "susceptor materials" have been developed.

A "susceptor" is a material used for its ability to absorb electromagnetic energy and convert it into heat. This energy is typically radiofrequency or microwave radiation used in industrial heating processes and in microwave cooking. The name is derived from *susceptance,* an electrical property of materials that measures their tendency to convert electromagnetic energy to heat.

Therefore, susceptor materials contain compounds that raise their temperature when subjected to microwaves. According to the use of the susceptor material and the temperature to be reached, the susceptor compounds are dispersed in or bound to different organic or inorganic binders.

As for the surface cooking of foods (so-called "browning" or "crisping"), typical susceptors are provided in the form of sheets and polyester films (PET) metallized with aluminum deposited in thin layers. These sheets are normally used in food packaging, i.e. coupled with cardboard or paper, and are placed in contact with food to give it the coloring and cooking needed. The susceptors of this type are not capable of withstanding repeated cycles of heating, and the packaging is thrown away after use. An additional problem is that the film in PET can release oligomers in cooked food, as reported in Begley et al., *Migration into food of polyethylene terephthalate*

(PET) cyclic oligomers from PET microwave susceptor packaging Food Addit Contam. 1990 Nov-Dec;7(6):797-803.

In order to address the problems mentioned above the so-called cooking "dishes" (crisping dish), in which the active susceptor compound, which reacts to microwaves, is dispersed in an inorganic binder and is applied to the upper layer of a support in dish shape, which is also generally inorganic are also known. A problem with these dishes is the fact that the susceptor compounds are not normally suitable for food contact.

To solve this problem, over the layer of susceptor material (e.g. graphite and sodium silicate) a layer of inert polymer material is applied such as Teflon, making the surface of the dish suitable for food contact.

U.S. patent No. US-4956533 relates to ceramic compositions usable in disposable packaging for precooked foods to be heated in microwave ovens. According to this patent, alumina (Al_2O_3), sodium metasilicate, kaolin, talc or similar ceramic materials are used in the hydrated form, alone or in combination with each other. Such materials are used along with a variety of binders, ranging from PVC to gypsum, which are mixed in a wet state, and then dried to a water content in the range between 2.5% and 10%. The disadvantages of this embodiment are due to the fact that heating is essentially based on the presence of water in the mixture of absorber compounds and the fact that the materials are not able to withstand prolonged or repeated cycles of heating.

U.S. patent No. US-5183787 relates to a ceramic composition usable as a susceptor for microwave heating. The ceramic composites are selected from vermiculite, bentonite, hectorite and zeolites, both in their original and amphoteric form. The compounds are previously activated by treatment with acids or bases in order to chemically modify the ceramic structure and add -OH groups. The activated materials are then mixed with a binder according to standard treatment technology of raw ceramics. The disadvantages of this solution are due to the fact that heating is mainly based on the presence of water in the mixture and the fact that the materials are not able to withstand repeated or prolonged heating cycles.

WO97/24295 describes a crisping dish that has a sodium silicate foam backing layer (or another alkaline earth silicate), anhydrous, i.e. a material transparent to microwaves, which has a non-foam smooth side on which is laid a layer of anhydrous silicate in which susceptor materials are incorporated, in particular graphite; above the active layer, containing susceptors, is applied a layer of high temperature - resistant polymer, in particular Teflon ®, which allows contact with food.

Crisp plates are also known, comprising a bottom support made of silicon rubber filled with a susceptor compound, e.g. ferrite, and an aluminum plate coated with Teflon ® located above the silicone support. In this kind of crisp plates, only the bottom, silicone, region has susceptor properties, therefore, when food is cooked into said plates, it is crisped only on its bottom surface. Moreover, each heating cycle results in heating of the silicone rubber and in a progressive deterioration of the silicone rubber.

WO2011/095883 discloses a composition for susceptor materials based on iron silicate (copper slag) and comprising an organic or inorganic binder, that is suitable for the production of heating elements of various kinds and various shapes, such as, for example, heat exchangers or coatings thereof, containers for heating or cooking foods such as pots pans and bowls, plates for cooking food and/or heating for the cooking units, tiles and hot-plates for ovens, heating elements of cylindrical shape similar to resistors, heating elements installed in boilers to produce sanitary hot water and/or heating hot water, fan coil units for heating air and the like. WO’883 discloses a preferred composition that comprises a percentage of iron silicate ranging between 30 wt% and 85%, preferably between 40 and 70 wt%.

A problem of cooking elements comprising copper slag, manufactured following the teachings of the above mentioned prior art, is that sometimes they may crack or fissure when cooking food. There was therefore the necessity of providing a cooking device for use in microwave cooking that is able to avoid the risk of cracking or breaking during the cooking step.

The applicant found that it is not sufficient to determine which are the "physical" aspects that make a cooking device reliable and safe and that it is preferable to apply specific conditions to the process of manufacture of said device in order to obtain the desired results i.e. a device for microwave cooking comprising copper slag that provides a reliable cooking element for a very long life cycle.

SUMMARY OF THE INVENTION

The aim of the present invention is to solve the problems of the known prior art providing a device for microwave cooking comprising an inorganic binder and copper slag, that is reliable and safe in every cooking conditions and that provides excellent browning and heating of the food.

A further aim of the invention is to provide a cooking device that can combine the advantages of microwave cooking with the advantages of traditional oven cooking. Another aim of the present invention is to provide a process for producing a device as mentioned above.

These aims are achieved by the present invention, that relates to a cooking device according to claim1. In particular, the cooking device of the invention comprises 10% to 45% by weight of copper slag and the porosity of the material of the cooking device (after the device has been subjected to a firing step) is in the range of 1% to 15% of water absorption, when measured according to UNI EN ISO 10545-3:2000.

It was surprisingly observed that a cooking device having the above mentioned structural features effectively avoid the risk of cracking or breaking during the cooking of food, further providing a crisping and browning effect that cannot be obtained with the known cooking devices. Furthermore it was observed that the required porosity can be obtained by controlling the temperature of firing of the shaped device; suitable firing temperatures are below 1180°C, preferably within the range of 950°C to 1160°C, more preferably from 1100°C to 1140°C, most preferably about 1130-1135°C. The skilled person can easily determine the correct firing temperature according to the material used for the device. It is believed that at high temperatures, i.e. above 1160-1180°C, the slag, i.e. the "iron silicate", may jeopardize the solidity of the device's structure, thus increasing the possibility of damages during the use of the cooking device.

Therefore, an object of the present invention is a device for microwave cooking, such as, for example, a slab, a pot or a pan, including lids, comprising an inorganic binder and a copper slag in a weight percentage, having the above mentioned porosity, measured as percentage of water absorption according to UNI EN ISO 10545-3:2000.

A further object of the present invention, is a process for producing a cooking device as mentioned above comprising a step of firing that is carried out at a temperature useful to provide the desired porosity. Namely, according to the process of the present invention, a copper slag is mixed with an inorganic binder, shaped into a desired cooking device and fired, wherein the amount of copper slag mixed with said inorganic binder is in the range of 10% to 45% by weight and said shaped device is fired at a temperature below 1180 °C to provide a porosity according to claim 1.

The cooking device of the present invention is further characterized by a specific range of porosity which is, according to UNI EN ISO 10545-3:2000, as stated above, from 1% to 15%, preferably from 2% to 12% and more preferably from 2% to 6% of water absorption. Porosity depends also on the material used as inorganic binder.

The device of the present invention comprises an inorganic binder. Inorganic binders suitable for the invention are known in the art. Said inorganic binders can be selected from high plasticity material for gres, namely for porcelain gres stoneware, terracotta, semi-refractory materials, refractory materials with low fusion point, atomized ceramic, clay, kaolin, feldspar and in general from all inorganic mixtures suitable to prepare pottery, earthenware, stoneware and ceramics and similar products.

A preferred material is the one used for porcelain gres. “Porcelain gres” is intended as the material that is called in Italian “gres porcellanato”. According to the known art, this material is usually fired at 1200-1400 C° until it reaches a non-porous vitrification and a complete water-proofing state; contrary to this, the present invention requires that the device is porous and that the firing temperature is less than 1180 C°, preferably 1160 C° or lower.

Another aspect of the present invention, is a food container, such as, for example, a plate, a serving plate, a dish, a bowl or dishware, that comprises an inorganic binder and copper slag, characterized in that the amount of said slag is in the range of 3 to 10% by weight of the device, 10% being preferably excluded.

BRIEF DESCRIPTION OF THE DRAWINGS

- Figures 1-A, 1-B and 1-C each show a section of different embodiments of the cooking device.

DETAILED DESCRIPTION OF THE INVENTION

The present invention relates to a cooking device for microwave cooking, comprising copper slag. In particular, the invention refers to a cooking device for microwave cooking, comprising an inorganic binder and copper slag, characterized in that said device comprises 10% to 45% by weight of copper slag and the porosity of said material is in the range of 1% to 15% of water absorption, when measured according to UNI EN ISO 10545-3:2000. The cited percent amounts of slag refer to the initial dry composition made of inorganic binder and slag (iron silicate) before the addition of water to obtain a plastic dough and also to the final, dry, cooking device after it has undergone the firing step; in the latter case, the percent by weight is calculated on the total weight of the device, excluding any metal lining part that may be present, as better explained in the following description.

In fact, it was found that after firing the percent amount of the slag in final device remains substantially similar to the initial one; the amount of glazing is generally not changing much the initial ratio of slag and binder. Metal linings are not included in the calculation of the percent of slag.

In a preferred embodiment, a cooking device according to the present invention comprises an amount of copper slag ranging from 15% to 35% by weight, preferably 20% to 30% by weight and more preferably 24% to 26%

by weight.

The cooking device of the present invention is suitable for microwave cooking as it comprises a susceptor compound, i.e. copper slag (also known as "iron silicate"), that greatly increases its temperature when exposed to electromagnetic fields, or electromagnetic waves, in particular microwaves (i.e. electromagnetic waves from 300 MHz to 300 GHz).

For the purposes of the present invention, the term "copper slag" refers to the inorganic compounds of iron silicate and to the inorganic compounds containing iron silicate; in particular it refers to the material that is known as a synthetic granulated slag resulting from the refining of ferrous metals and of non ferrous metals, in particular as a byproduct of copper metallurgy. The aforesaid slag is normally referred to as “iron silicate” and is used as such, without any special preventive refining. Obtained by cooling the molten slag in water, the "iron silicate" is a solid of a shiny and glassy black color.

The cooking device of the present invention is further characterized by a specific range of porosity which is, according to UNI EN ISO 10545-3:2000, as stated above, from 1% to 15%, preferably from 2% to 12% and more preferably from 2% to 6% of water absorption. Porosity depends also on the material used as inorganic binder.

Said value of porosity, in combination with an adequate amount of copper slag selected from the claimed ranges, provide a cooking device the is able to effectively cook and crisp food, while avoiding the risk of breaking of the cooking device when exposed to microwaves.

The device of the present invention comprises an inorganic binder. Inorganic binders suitable for the invention are known in the art. Said inorganic binders can be selected from high plasticity material for gres, namely for porcelain gres (gres porcellanato) stoneware, terracotta, semi-refractory materials, refractory materials with low fusion point, atomized ceramic, clay, kaolin, feldspar and in general from all inorganic mixtures suitable to prepare pottery, earthenware, stoneware and ceramics and similar products.

A preferred material is the one used for porcelain gres. “Porcelain gres” is intended as the material that is called in Italian “gres porcellanato”. According to the known art, this material is usually fired at 1200-1400 C° until it reaches a non-porous vitrification and a complete water-proofing state; contrary to this, the present invention requires that the device is porous and that the firing temperature is less than 1180 C°, preferably lower than 1160 C° and about 1130-1140 C.

As already discussed above, a cooking device according to the present invention comprises copper slag as susceptor compound. The granulometry of said copper slag is preferably less than 125 μm, more preferably ranging from 50 μm and 70 μm.

Different materials have different behavior, depending on their nature, when subjected to irradiation by radiation from an electromagnetic field or by electromagnetic waves. For example, a conductive material, such as a metal, completely reflects the radiation while an insulating material, as for example ceramic, results "transparent" to radiation: in both cases, energy is not absorbed by these materials.

Electromagnetic radiation, therefore, depending on the type and condition of the material may be transmitted, reflected or absorbed.

In a preferred embodiment, a cooking device according to the present invention comprises an inorganic binder that is at least in part transparent to radiation, i.e. transparent to microwaves.

A cooking device according to the present invention could comprise a metal layer located on the inner side of said device, including lateral walls, when present. Metals do not absorb microwave energy, they simply reflect the microwaves energy without heating up.

In this particular embodiment, i.e. a ceramic structure combined with a metal layer, when the cooking device of the present invention is exposed to microwaves, it increases its temperature, heating up the metal layer which cooks food providing a browning and crisping effect that could not be obtained by means of the previously known methods of microwave cooking.

A cooking device according to the present invention preferably comprises a coating layer.

As shown in Fig. 1-A, a coating layer 3 can be applied directly on the surface 1 of the cooking device, before or after it has been fired.

With reference to Fig. 1-A, in another embodiment of the present invention, a device according to the invention can comprise lateral walls. In this case, a part of microwaves is transmitted to the food contained in the device through the side walls, depending on the permeability of the device to the microwaves. The desired permeability to microwaves can be obtained by balancing the amount of slag in the device.

In another embodiment, as shown in Fig. 1-B, a metal layer 2 is applied on the internal surface 1 of the cooking device; in this particular embodiment, a coating layer is not required, as the metal layer is suitable to contact food.

In a further embodiment, shown in Fig. 1-C, over the surface 1 of the cooking device is applied a metal layer 2 as per fig. 1-B, and over said metal layer 2 a further coating layer 3.

Said coating layer can be, for example, a ceramic enamel coating or a sol/gel enamel coating.

Said coatings may be applied by immersion coating or spray coating.

With reference to Fig. 1-B or 1-C, in another embodiment of the present invention, a device according to the invention can comprise lateral walls and metal layer located on the inner side of said device, including lateral walls. In this case, since metals do not absorb microwave energy, but they simply reflect the microwaves energy without heating up, microwaves can reach directly the food in the device from above and cook it by their standard action. At the same time, when exposed to microwaves, the device according to the present invention increases its temperature, heating up the inner metal layer which cooks food providing a browning and crisping effect, similar to traditional cooking, thus providing a combined effect of cooking, with the advantages of microwave cooking and also with the advantages of traditional cooking.

The thickness of the final device may vary depending on the kind of device, the shape of the device, the nature of the metal and coating layer, and the method to apply them.

For example, plates according to the present invention can have a thickness ranging from 5 mm to 12 mm, preferably from 7 mm to 10 mm.

In a preferred embodiment of the invention, the cooking device includes a base part, where the food is placed, and a lid part, having the same, or different, composition and features of the base part, suitable to close the food into said device.

In another embodiment, the percent amount of slag in said lid part is different from the percent amount of slag in said base part. In particular, the amount of slag in the lid is balanced to provide a desired permeability to microwaves: by reducing the amount of slag in the lid, optionally by having a lid with no slag at all, microwaves can reach the food in the device and cook it by their standard action. At the same time, the base part of the device, that contains slag and optionally also a metal layer, will provide a different cooking effect, similar to traditional cooking, thanks to the heat developed by the device containing the slag.

According to another aspect of the present invention, it is provided a process for producing a cooking device as mentioned above, wherein a copper slag is mixed with an inorganic binder, shaped into a desired cooking device and fired.

Particularly, said process is characterized in that the amount of copper slag mixed with said inorganic binder, is in the range of 10% to 45% by weight and said shaped device is fired at a temperature below 1180°C to provide a porosity in the range of 1% to 15% of water absorption, when measured according to UNI EN ISO 10545-3:2000.

More specifically, said shaped device is fired at a temperature ranging from to 950°C to 1160°C, preferably from 1100°C to 1140°C, most preferably about 1130 to 1140°C in a preferred embodiment, the firing temperature is about 1135°C. By using this range of temperatures, the desired porosity, and therefore resistance to breaking, is obtained. The temperature also depends on the binder material; for terracotta the preferred firing temperature is about 950-1050 C°, for semi-refractory materials the preferred temperature is 1000-1100 C° and for refractory materials at low m.p. the preferred temperature is maximum 1150C°.

As mentioned, for the porcelain gres material that is the preferred material according to the invention, the preferred temperature is 1130-1140 C°.

“Porcelain gres” is intended as the material that is called in Italian “gres porcellanato”.

More in detail, a process for producing a cooking device according to the present invention comprises the following steps:

a. Preparation of so-called "breads" made of a mixture of copper slag and inorganic binder,
b. Shaping of the mixture breads,
c. Drying of the obtained shaped devices,
d. Firing said shaped devices at a temperature below 1180°C.

The present process can further comprise a step (e.) of enameling, when a coating layer is desired.

In a preferred embodiment, the enameling of the shaped devices can be performed before the step (d.) of firing. In this case, enamel is applied directly on the dried shaped device; subsequently, the enameled device is fired.

The enameling of the devices of the present invention can be performed by immersion or by spray application. When the enameling step is carried out by immersion, the shaped devices are passed in an aqueous bath of enamel in order to obtain an homogeneous enamel coating.

In a preferred embodiment, an amount of copper slag ranging from 10% to 45% by weight is dry mixed with an inorganic binder. Water is then added to the mix in order to obtain a plastic dough, that is subsequently drawn in pieces, i.e. breads, suitable to be pressed.

Drying of the shaped device can be performed at room temperature for 24-48 hours, or in a stove at a temperature ranging from 70°C to 80°C for 12 hours.

The firing step (d.) is preferably performed at a temperature below 1160, preferably ranging from 1130°C to 1140°C for porcelain gres (gres porcellanato), preferably at a temperature of 1135°C, for 24 hours.

In a most preferred embodiment, a process for producing a cooking device according to the present invention comprises the following phases:

a. Preparation of so-called “breads” made of a mixture of copper slag and inorganic binder,
performed with the steps of:
   - a-i. dry mixing of copper slag (25%) by weight (dry weight of slag on the total dry composition before the addition of water) in an inorganic binder such as atomized, i.e. powdered, ceramic material, preferably a material for porcelain gres (gres porcellanato),
   - a-ii. adding water in controlled quantity (e.g.15% - 20%) suitable to obtain a plastic dough (preferably the dough’s hardness is less than 1kg/cm^2 when measured by a penetrometer)
   - a-iii. Drawing of said plastic dough into “breads” suitable to be pressed

b. Shaping of the mixture breads, by means of uniaxial press on plaster molds,

c. Drying of the obtained shaped devices, at room temperature for 24-48 hours, or in a stove at a temperature ranging from 70°C to 80°C for 12 hours.

d. Firing said shaped devices in gas oven at a temperature ranging from 1130°C to 1140°C for 24 hours.

e. Spray enameling with sol-gel enamel, performed with the steps of:
   - e-i. Applying spray enamel on rotating substrates,
   - e-ii. Annealing of enamel carried out in oven at 350°C.

In a preferred embodiment a material for porcelain gres (gres porcellanato) has porosity in the range 2 to 6% and it is fired at a temperature of 1130-1140C.

“Porcelain gres” is intended as the material that is called in Italian “gres porcellanato".

According to a further object of the present invention, it is provided a food container, that comprises an inorganic binder and copper slag.

Preferably, a food container according to the present invention is characterized in that the amount of said slag is in the range of 3% to 10% by weight, 10% being preferably excluded. This amount of slag is sufficient to provide food containers that will be heated by the microwaves to a lower temperature that the cooking temperatures previously disclosed. In other words, with the above mentioned amounts the food container heats the food to keep it warm: it is thus suitable for food serving plates, trays, casseroles or food serving devices in general.

More in particular, the present food container comprises an inorganic binder that can be selected from terracotta, semi-refractory materials, refractory materials with low fusion point, atomized ceramic, clay kaolin, feldspar and inorganic mixtures suitable to prepare pottery, earthenware, stoneware and ceramics. A preferred material is high plasticity powdered material for porcelain gres stoneware. "Porcelain gres" is intended as the material that is called in Italian "gres porcellanato"

In a preferred embodiment, a food container according to the present invention is selected from plates, serving plates, dishes, bowls and dishware.

Additional features of the present invention will become more apparent by the following experimental examples.

EXAMPLES

Example 1. Meat cooking.

A 100g beef meat hamburger was cooked in a microwave oven using a cooking device according to the invention.

In particular, a circular container comprising 35% copper slag according to the invention was used as cooking device.

After a pre-heating at 180°C, having buttered the inner side of the device, including lateral walls, the hamburger was cooked at "Jet power" (700-800W), for 1 minute for each side of the hamburger.

After a 1 minute cooking for each side, the hamburger was adequately cooked, and browned.

Example 2. Baking test of frozen croissant

A frozen croissant was baked in a microwave oven, by means of a ceramic container according to the present invention.

The device according to the invention was preheated at 900W power for 4 minutes, reaching the temperature of 180°C.

A frozen croissant was put into the preheated device, and was cooked with a cooking cycle composed by a first microwave phase and a second microwave plus grill phase.

After a 6 minutes cycle the cooked croissant was extracted from the from the oven and cooled at room temperature.

Baking the frozen croissant by means of a device according to the invention provided good results in aspect and taste of the croissant, in a short time.

In particular, the lower part of croissant quickly browns thanks to the contact with the device’s hot surface, while the inner part shows a good growth exfoliation of the dough, thanks to the progressive heat release from the device.

As the microwave oven was equipped with a quartz tube grill element also a good browning of the upper part of the croissant was obtained.

Furthermore, if a 30 cm diameter device according to the invention is used, is possible to quickly defrost and bake, in a conventional microwave oven, up to 4 croissants at the same time.

This test demonstrated that a device according to the present invention can defrost and bake a frozen raw dough in a very short time thanks to the combined action of the device and microwaves.

Furthermore, this test demonstrated that a device according to the present invention can brown and crisp the surface of the croissant thanks to the high baking temperature reached by the device, and avoid the undesirable effects of a microwave cooking with known devices, such as excessive swelling and softening.

Example 3. Comparative test, cake cooking

The same quantity of a cake mix was baked in a baking dish according to the present invention as well as in a commercially available crisp plate.

It was observed that the dish according to the present invention is a little slower (3 minutes slower) to reach 150°C, as the ceramic has higher thermal capacity than metal, but can reach higher temperatures, i.e. up to 250°C, than the crisp plate, that has a maximum temperature of 210°C, with a better heating homogeneity in the invention plate.

Furthermore the dish according to the invention can heat up also in its lateral part, while the lateral part of the crisp plate remains cooler.

The capability of the dish according to the invention to heat up also in its lateral part, provide a desirable browning effect also on the lateral surface of the cake, that cannot be obtained using known crisp plates.

Example 4. Comparative test, potatoes cooking

Comparative test were carried out, comparing a cooking device, manufactured and glazed according to the above description, with a normal microwaveable ceramic dish.

500 grams of potatoes cut into a plurality of pieces having substantially uniform dimensions were cooked in a microwave oven for 15 min, at "Jet power" (950 W) in a dish according to the invention and, by comparison, in a standard microwave dish.

During the exposition to the microwaves, it was observed that the surface of the container according to the invention reached a temperature of 150°C – 170°C, while the normal dish reached a maximum temperature of 95°C, thus indicating that, at the same operating power, a device according to the invention has a higher capability to heat up the food in respect to a normal microwaveable ceramic dish.

After the cooking cycle, it was observed that potatoes cooked in the container according to the invention were browned and crunchy, while potatoes cooked in the normal microwaveable ceramic dish were soggy and not browned.

Another test was carried out to compare microwave cooking with the device of the invention of 500 grams of diced potatoes as already mentioned, with cooking of the same quantity of potatoes using a convection electric oven.

This test demonstrated that results obtained by microwave cooking of 500 grams of potatoes for 15 min, by using the device of the present invention, are similar to the results obtained by conventional cooking using a convection electric oven heated at 180°C for 40 minutes, with a pre-heating of 10 minutes.

These test demonstrated that a cooking device according to the present invention is more performing than normal microwaveable ceramic dishes, and that microwave cooking using said device provide the same results of a convention electric oven considerably reducing the cooking times.

In fact, the device of the present invention strongly reduces the cooking time when compared to a convection electric oven; in this case, 15 minutes instead a total time of 50 minutes, anyway obtaining very similar or better results concerning appearance and taste of the cooked food.

On the contrary, when the present cooking device is compared with a normal microwaveable ceramic dish, applying the same conditions of cooking, qualitatively better results are obtained by the device of the invention, concerning appearance and taste of the cooked food.

Therefore, it was demonstrated that a cooking device according to the present invention combines the advantages of the microwave cooking, such as, for example, short times for cooking and easy handling of the microwave oven, with the advantages of the traditional convection oven cooking, such as the browning and crisping effect.

CLAIMS

1. A cooking device for microwave cooking, comprising an inorganic binder and copper slag, characterized in that said device comprises 10% to 45% by weight of copper slag and the porosity of said material is in the range of 1% to 15%, when measured according to UNI EN ISO 10545-3:2000.

2. A cooking device according to claim 1, wherein the amount of copper slag is in the range of 15% to 35% by weight, preferably 20% to 30% by weight.

3. A cooking device according to claim 1 or 2, wherein the amount of copper slag is in the range of 24% to 26% by weight.

4. A cooking device according to any claim 1 to 3, wherein said porosity value measured according to UNI EN ISO 10545-3:2000 is within the range of 2% to 12%, preferably 2% to 6%.

5. A cooking device according to any previous claim, further comprising a metal layer located on the inner side of said device, including lateral walls when present.

6. A cooking device according to any previous claim, wherein said cooking device includes a base part and a lid part.

7. A cooking device according to claim 6, wherein the percent amount of slag in said lid part is different from the percent amount of slag in said base part.

8. A cooking device according to any previous claim, wherein inorganic binder is selected from terracotta, semi-refractory materials, refractory materials with low fusion point, atomized ceramic, clay, kaolin, feldspar and inorganic mixtures suitable to prepare pottery, earthenware, stoneware and ceramics, a high plasticity material for porcelain stoneware, preferably for porcelain gres.

9. A cooking device according to claim 8, wherein said device is made of a material suitable to prepare a porcelain gres and has a porosity within the range of 2 to 6%.

10. A process of producing a cooking device according to any claim 1 to 9,

wherein a copper slag is mixed with an inorganic binder, shaped into a desired cooking device and fired, characterized in that the amount of copper slag mixed with said inorganic binder is in the range of 10% to 45% by weight and said shaped device is fired at a temperature below 1180 °C to provide a porosity according to claim 1.

11. A process according to claim 10, wherein said firing temperature is in the range of 950°C to 1160°C, preferably from 1100°C to 1140°C, more preferably 1130-1140°C.

12. A food container that comprises an inorganic binder and copper slag, characterized in that the amount of said slag is in the range of 3 to 10% by weight, 10% being preferably excluded.

13. A food container according to claim 12, wherein said inorganic binder is selected from terracotta, semi-refractory materials, refractory materials with low fusion point, atomized ceramic, clay kaolin, feldspar and inorganic mixtures suitable to prepare pottery, earthenware, stoneware and ceramics.

14. A food container according to claim 13, wherein said inorganic binder is a high plasticity material for porcelain stoneware, preferably for porcelain gres.

15. A food container according to claim 13 or 14, that is selected from plates, serving plates, dishes, bowls and dishware.

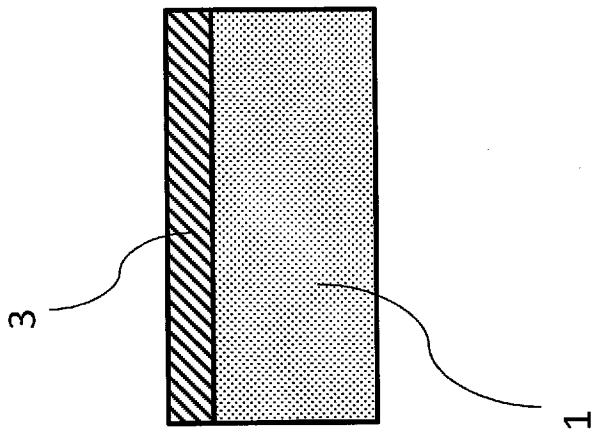

Fig. 1-A

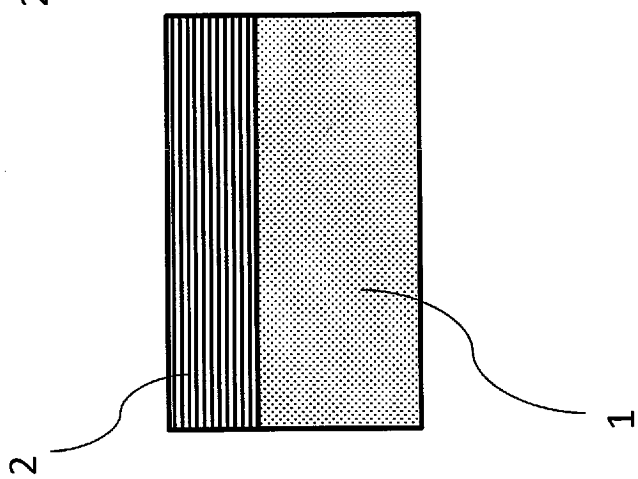

Fig. 1-B

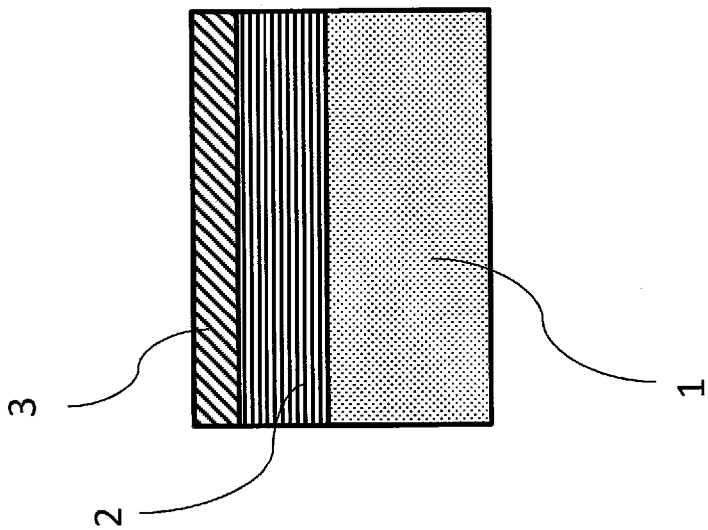

Fig. 1-C